GRADE 12 DIPLOMA EXAMINATION

Chemistry 30

June 1989

Alberta
EDUCATION

GRADE 12 DIPLOMA EXAMINATION
CHEMISTRY 30

DESCRIPTION

Time: 2½ hours

Total possible marks: 70

This is a **CLOSED-BOOK** examination consisting of two parts:

PART A: 56 multiple-choice questions each with a value of 1 mark.

PART B: Three written-response questions for a total of 14 marks.

A chemistry data booklet is provided for your reference. Approved calculators may be used.

GENERAL INSTRUCTIONS

Fill in the information on the answer sheet as directed by the examiner.

For multiple-choice questions, read each carefully and decide which of the choices BEST completes the statement or answers the question. Locate that question number on the answer sheet and fill in the space that corresponds to your choice. USE AN HB PENCIL ONLY.

Example

This examination is for the subject area of

A. Biology
B. Chemistry
C. Mathematics
D. Physics

Answer Sheet

A	B	C	D
①	●	③	④

If you wish to change an answer, please erase your first mark completely.

For written-response questions, read each carefully, show all your calculations, and write your answer in the space provided in the examination booklet.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

DO NOT FOLD EITHER THE ANSWER SHEET OR THE EXAMINATION BOOKLET

The presiding examiner will collect the answer sheet and examination booklet for transmission to Alberta Education.

JUNE 1989

PART A

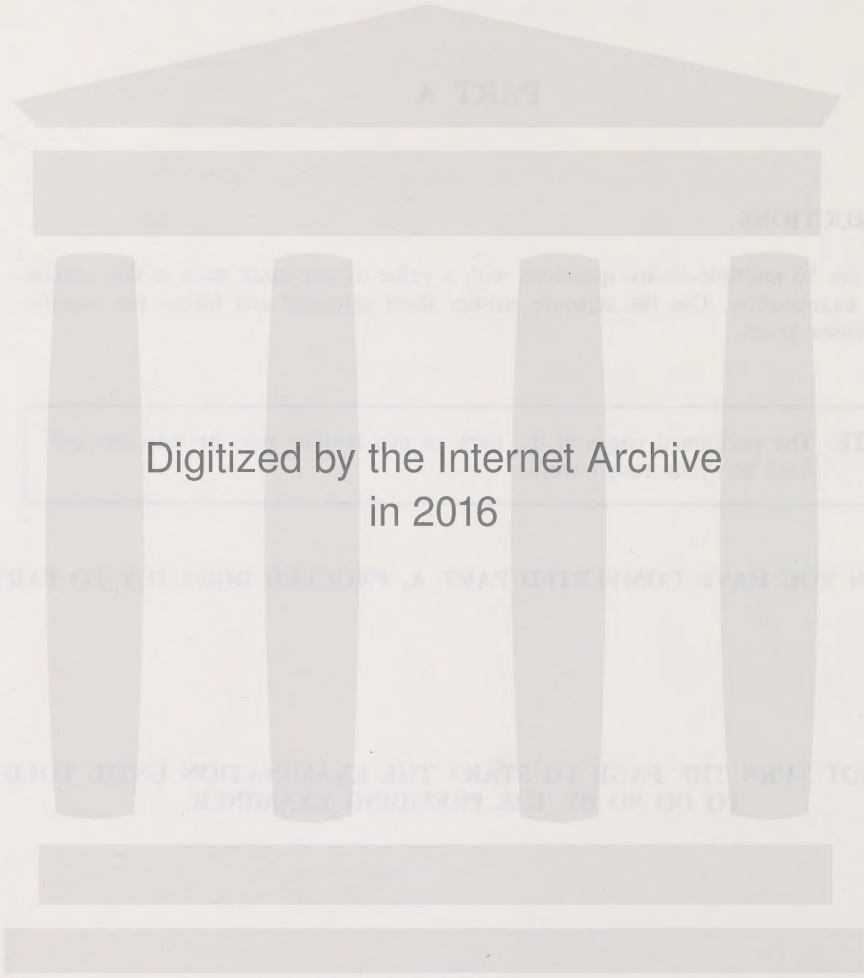
INSTRUCTIONS

There are 56 multiple-choice questions with a value of one mark each in this section of the examination. Use the separate answer sheet provided and follow the specific instructions given.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

WHEN YOU HAVE COMPLETED PART A, PROCEED DIRECTLY TO PART B

DO NOT TURN THE PAGE TO START THE EXAMINATION UNTIL TOLD TO DO SO BY THE PRESIDING EXAMINER



1. The temperature of $C_2H_5OH(l)$ increases from 5.0°C to 25.0°C. The energy change reflected is an increase in

A. temperature
B. kinetic energy
C. potential energy
D. both potential and kinetic energy

2. A Bunsen burner was used to heat 40 mL of water for a period of six minutes. The same burner was used to heat 250 mL of water for a period of six minutes. Both samples of water were at the same initial temperature, and no phase changes were observed during the six-minute period. Which statement is TRUE?

A. The E_p of both samples increases significantly.
B. The average E_k of both samples is the same after heating.
C. The 40 mL sample absorbs more heat than the 250 mL sample.
D. The average E_k of the 250 mL sample is less than that of the 40 mL sample after heating.

Use the following data to answer question 3.

A student compiled the following data table:

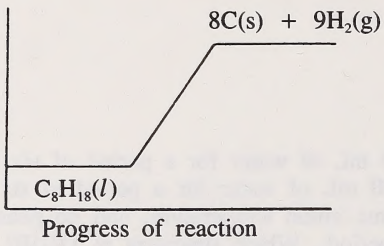
Substance	Melting Point	Boiling Point
H_2X	−120°C	12°C
H_2O	0°C	100°C

3. The student should infer from these data that

A. at 20°C, H_2X is in the liquid state
B. at −120°C, the E_p of $H_2X(s)$ is greater than the E_p of $H_2X(l)$
C. H_2O molecules have stronger intermolecular forces than H_2X molecules
D. at a given temperature, the average E_k of H_2O molecules is greater than the average E_k of H_2X molecules

4. Which diagram could best represent the standard heat of formation for octane, $C_8H_{18}(l)$?

A.



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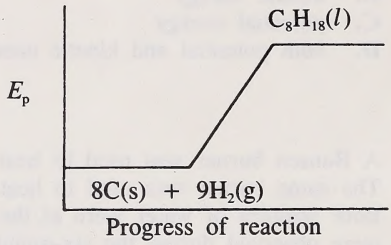

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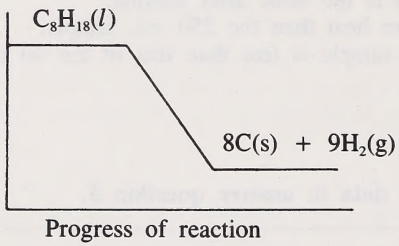
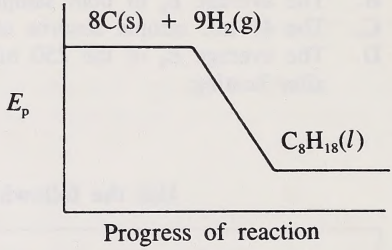


D.



5. The equation that correctly illustrates the formation of calcium oxide is

A. $2Ca(s) + O_2(g) \longrightarrow 2CaO(s) + 635.5\ kJ$
B. $Ca(s) + \frac{1}{2}O_2(g) \longrightarrow CaO(s) + 635.5\ kJ$
C. $Ca(s) + \frac{1}{2}O_2(g) + 635.5\ kJ \longrightarrow CaO(s)$
D. $2Ca(s) + O_2(g) + 1271\ kJ \longrightarrow 2CaO(s)$

6. Carbon in the form of graphite has a ΔH_f° value of 0.0 kJ/mol, while carbon in the form of diamond has a ΔH_f° value of +1.9 kJ/mol. This difference is due to

A. a decrease in kinetic energy as the crystal structure of graphite changes
B. an increase in kinetic energy stored in the crystal structure of diamond
C. an increase in potential energy stored in the crystal structure of diamond
D. a decrease in potential energy as the crystal structure of graphite changes

Use the following information to answer question 7.

Consider the following three changes that involve the same mass of H_2O:

I. $H_2O(s)$ at $-100°C \longrightarrow H_2O(s)$ at $0°C$

II. $H_2O(l)$ at $0°C \longrightarrow H_2O(l)$ at $100°C$

III. $H_2O(g)$ at $100°C \longrightarrow H_2O(g)$ at $200°C$

7. Which statement below is correct?

A. Change I would require the greatest amount of heat energy.
B. Change II would require the greatest amount of heat energy.
C. Change III would require the greatest amount of heat energy.
D. All three changes would require the same amount of heat energy.

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8. A correct interpretation about an exothermic reaction is that, during the reaction, the

A. surroundings gain energy
B. surroundings lose energy
C. reactants gain energy to form products
D. enthalpy of the products is greater than the enthalpy of the reactants

Use the following information to answer question 9.

Some changes that involve a loss or gain of energy are listed below:

I. Evaporation of water
II. Formation of NO(g)
III. Condensation of steam
IV. Explosion of dynamite

9. The endothermic processes are

A. I and II
B. I and IV
C. II and III
D. III and IV

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10. It is likely that a chemical change will involve more energy than a phase change because

A. during a phase change, much of the energy is used to change the temperature of the material

B. there is more energy involved in breaking and forming bonds between molecules than within molecules

C. there is more energy involved in breaking and forming bonds within molecules than between molecules

D. a chemical change involves a potential energy change, while a phase change involves a kinetic energy change

11. The ΔH value for $CH_3COOH(l) + 2O_2(g) \longrightarrow 2CO_2(g) + 2H_2O(g)$ is

A. -1270.6 kJ
B. -783.6 kJ
C. -635.3 kJ
D. -487.0 kJ

12. For a calorimetric experiment to determine the molar heat of combustion for a fuel, the information that would not be required is the

A. time required to burn the fuel
B. heat capacity of the calorimeter
C. mass of the calorimeter and its contents
D. temperature change of the calorimeter and its contents

13. After 4.00 kJ of heat energy are added to a beaker containing 100 g of ice at $-20°C$, the beaker will contain

A. only water above 0°C
B. only water at 0°C
C. water and ice
D. ice only

14. During an experiment a student burned 60.0 g of ethane, and all of the resulting energy was used to heat 6.00 kg of water. The temperature of the water increased from 16.1°C to 92.5°C. The molar heat of combustion for ethane calculated from this experiment is

A. -8.47×10^1 kJ/mol
B. -9.63×10^2 kJ/mol
C. -1.43×10^3 kJ/mol
D. -1.92×10^3 kJ/mol

Use the following information to answer question 15.

Prior to an experiment, the following information was obtained from a chemistry reference source:

$\frac{1}{2}H_2(g) + \frac{1}{2}I_2(s) \longrightarrow HI(g) \qquad \Delta H = +25.9$ kJ

$I_2(s) \longrightarrow I_2(g) \qquad \Delta H = +61.8$ kJ

15. The predicted ΔH value for the reaction represented by the equation $H_2(g) + I_2(g) \longrightarrow 2HI(g)$ should be

A. +113.6 kJ
B. +87.7 kJ
C. −10.0 kJ
D. −35.9 kJ

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16. The reaction for the combustion of 1-octene is

$C_8H_{16}(l) + 12O_2(g) \longrightarrow 8CO_2(g) + 8H_2O(g) + 4902.4$ kJ.

The heat of formation for $C_8H_{16}(l)$ is

A. −120.0 kJ/mol
B. −180.0 kJ/mol
C. −208.0 kJ/mol
D. −304.0 kJ/mol

Use the following equation to answer question 17.

$3C(s) + 2Fe_2O_3(s) + 458.7 \text{ kJ} \longrightarrow 4Fe(s) + 3CO_2(g)$

17. The ΔH value for the equation using one mole of carbon would be

A. −458.7 kJ
B. −152.9 kJ
C. +152.9 kJ
D. +458.7 kJ

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18. While barbecuing meat in the backyard, the cook noticed that the meat was cooking too slowly, so the number of charcoal briquettes used was doubled. By using more charcoal, the cook was applying the concept

A. of Hess's Law

B. that energy transfer depends upon the rate of combustion

C. that, from the addition of ΔH values for known reactions, ΔH values for new reactions can be predicted

D. that the amount of energy involved in a chemical reaction is proportional to the number of moles of reactants

19. A base can be described as a substance that

A. tastes bitter
B. turns blue litmus red
C. decreases the pH of a solution
D. reacts with Zn(s) to produce $H_2(g)$

Use the following data to answer question 20.

In order to identify aqueous solutions of NaCl, NaOH, H_2SO_4, and CH_3OH, students performed a series of experiments on each solution and obtained the data below:

	Electrolyte	Blue Litmus	Red Litmus	Reaction with Zn(s)
Solution I	yes	red	red	production of $H_2(g)$
Solution II	yes	blue	blue	production of a precipitate
Solution III	yes	blue	red	no reaction
Solution IV	no	blue	red	no reaction

20. According to the data, the H_2SO_4 solution is

A. I
B. II
C. III
D. IV

21. Hydrogen gas is produced when magnesium metal reacts with 1.0 mol/L of

A. $CH_3OH(aq)$
B. $C_2H_5OH(aq)$
C. $CH_3COOH(aq)$
D. $C_6H_{12}O_6(aq)$

22. Liquid waste from an industrial plant was found to have a pH of 1.36. Which of the following could be added to the waste to neutralize it?

A. $NaHCO_3(s)$
B. $C_2H_5OH(l)$
C. $NaCl(s)$
D. $HCl(aq)$

23. Which statement about acids is true?

A. Acids increase the $[H_3O^+(aq)]$ in a solution.
B. Acids increase the $[OH^-(aq)]$ in a solution.
C. Acids accept protons in a chemical reaction.
D. Acids increase the pH of an aqueous solution.

Use the following equation to answer question 24.

$$HSO_3^-(aq) + OH^-(aq) \rightleftharpoons HOH(l) + SO_3^{2-}(aq)$$

24. The Brønsted-Lowry acids in the reaction are

A. $HOH(l)$ and $OH^-(aq)$

B. $HSO_3^-(aq)$ and $HOH(l)$

C. $SO_3^{2-}(aq)$ and $OH^-(aq)$

D. $HSO_3^-(aq)$ and $SO_3^{2-}(aq)$

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25. Which substance will most readily accept a proton from $HCO_3^-(aq)$?

A. $SO_4^{2-}(aq)$

B. $PO_4^{3-}(aq)$

C. $ClO_4^-(aq)$

D. $H_2PO_4^-(aq)$

26. Predict which 0.10 mol/L solution would have the lowest pH.

A. $HNO_3(aq)$
B. $NaHSO_4(aq)$
C. $Na_2SO_3(aq)$
D. $C_6H_5COOH(aq)$

Use the following data to answer question 27.

$HA(aq) + C^-(aq) \leftrightharpoons HC(aq) + A^-(aq)$ (products favored)

$HB(aq) + D^-(aq) \leftrightharpoons HD(aq) + B^-(aq)$ (products favored)

$HC(aq) + D^-(aq) \leftrightharpoons HD(aq) + C^-(aq)$ (reactants favored)

$HD(aq) + A^-(aq) \leftrightharpoons HA(aq) + D^-(aq)$ (products favored)

27. A list of the four aqueous acids in order of decreasing strength is

A. HA, HD, HB, HC
B. HB, HD, HA, HC
C. HC, HD, HB, HA
D. HD, HB, HC, HA

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28. 12.0 mol/L $CH_3COOH(aq)$ is best described as a

A. concentrated solution of strong acid
B. concentrated solution of weak acid
C. dilute solution of strong acid
D. dilute solution of weak acid

29. If 5.0 g of NaOH(s) dissolves in enough water to form 0.60 L of solution, the pH of the solution would be

A. 0.21
B. 0.68
C. 13.10
D. 13.32

Use the following observations to answer question 30.

The addition of indicators to a 0.10 mol/L solution of a base produced the following colors:

indicator	color
phenol red	red
phenolphthalein	colorless

30. The concentration of the hydroxide ion was approximately

A. 1.3×10^{-6} mol/L
B. 1.0×10^{-8} mol/L
C. 7.9×10^{-9} mol/L
D. 1.6×10^{-9} mol/L

Use the following observations to answer question 31.

A student recorded observations regarding the colors of various indicators in an unknown acid solution:

I. The solution turns red with the addition of methyl red.
II. The solution turns blue with the addition of indigo carmine.
III. The solution turns blue with the addition of bromothymol blue.
IV. The solution turns neutral litmus paper red.

31. Which observation is inconsistent with the other observations?

A. Observation I
B. Observation II
C. Observation III
D. Observation IV

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32. A balanced Brønsted-Lowry acid-base equation always has

A. equal concentrations of hydroxide and hydronium ions
B. equal numbers of hydroxide and hydronium ions
C. equal concentrations of acids and bases
D. two acids and two bases

33. The pH of a basic solution that has an $[OH^-(aq)]$ of 6.4×10^{-3} mol/L is

A. 11.81
B. 2.19
C. 1.00
D. −11.81

34. A hypothetical acid HM(aq) has a pH of 3.25 in a 0.10 mol/L solution. The percentage reaction with water for this acid is

A. $5.6 \times 10^{-4}\%$
B. $5.6 \times 10^{-3}\%$
C. $5.6 \times 10^{-2}\%$
D. $5.6 \times 10^{-1}\%$

35. A 0.409 g sample of impure methanoic acid was titrated with a 0.100 mol/L NaOH solution. It required 50.0 mL of the NaOH solution to neutralize the acid. What per cent (by mass) of the sample was methanoic acid?

A. 0.312%
B. 0.624%
C. 28.1%
D. 56.3%

36. What volume of 2.00 mol/L H_2SO_4 solution would be needed to react completely with 4.20 g of solid Na_2CO_3?

A. 19.8 mL
B. 25.3 mL
C. 39.6 mL
D. 79.2 mL

37. If 200.0 mL of 0.300 mol/L HCl(aq) are added to 300.0 mL of 0.150 mol/L NaOH(aq), the equilibrium $[H_3O^+(aq)]$ is

A. 0.0150 mol/L
B. 0.0300 mol/L
C. 0.0500 mol/L
D. 0.0750 mol/L

38. In which half-reaction does reduction occur?

A. $2Ni(OH)_2(s) + 2OH^-(aq) \longrightarrow 2NiO(OH)(s) + 2H_2O(l) + 2e^-$

B. $2MnO_2(s) + H_2O(l) + 2e^- \longrightarrow Mn_2O_3(s) + 2OH^-(aq)$

C. $Pb(s) + HSO_4^-(aq) \longrightarrow 2e^- + PbSO_4(s) + H^+(aq)$

D. $Cu(s) \longrightarrow Cu^{2+}(aq) + 2e^-$

39. An example of an oxidation process would be

A. a calcium ion forming a calcium atom
B. a chlorine atom forming a chloride ion
C. oxygen gas, O_2, reacting to form ozone gas, O_3
D. a chromium(II) ion forming a chromium(III) ion

40. In a redox reaction, the oxidizing agent

A. gains electrons and is oxidized
B. loses electrons and is oxidized
C. loses electrons and is reduced
D. gains electrons and is reduced

41. If $X^+(aq)$ is a stronger oxidizing agent than $Y^+(aq)$, then

A. the reaction $Y^+(aq) + X(s) \longrightarrow Y(s) + X^+(aq)$ is spontaneous
B. Y(s) is a stronger reducing agent than X(s)
C. $X^+(aq)$ will oxidize $Y^+(aq)$
D. $Y^+(aq)$ will reduce X(s)

42. Which reaction is an oxidation-reduction reaction?

A. $NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$
B. $AgNO_3(aq) + KI(aq) \longrightarrow AgI(s) + KNO_3(aq)$
C. $Mg(OH)_2(s) + H_2SO_4(aq) \longrightarrow MgSO_4(aq) + 2H_2O(l)$
D. $Cu(s) + 4HNO_3(aq) \longrightarrow Cu(NO_3)_2(aq) + 2NO_2(g) + 2H_2O(l)$

43. What is the oxidation number of iodine in $HIO_6^{4-}(aq)$?

A. +11
B. +9
C. +7
D. −3

44. In the balanced equation

$$6I^-(aq) + 2MnO_4^-(aq) + 4H_2O(l) \longrightarrow 3I_2(s) + 2MnO_2(s) + 8OH^-(aq),$$

the number of moles of electrons transferred is

A. 2 mol
B. 3 mol
C. 6 mol
D. 7 mol

Use the following data to answer question 45.

A student prepared a solution of acidified $SnCl_2(aq)$ and then titrated this solution with $KMnO_4(aq)$. The student's data were recorded as follows:

I. concentration of $SnCl_2(aq)$	0.0790 mol/L
II. volume of $SnCl_2(aq)$ solution prepared	100.0 mL
III. volume of acid added to $SnCl_2(aq)$	3.0 mL
IV. volume of $SnCl_2(aq)$ solution used in the titration	10.0 mL
V. volume of $KMnO_4(aq)$ solution used in the titration	12.8 mL

45. In order to calculate correctly the concentration of $MnO_4^-(aq)$, in addition to the balanced chemical equation, one would use

A. I, II, and V
B. I, IV, and V
C. I, II, IV, and V
D. I, II, III, IV, and V

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46. In a laboratory experiment, 12.5 mL of a 0.200 mol/L potassium permanganate solution are required to react completely with 100 mL of an acidic solution containing iron(II) ions. The concentration of iron(II) ions in the acidic solution is

A. 2.50×10^{-3} mol/L
B. 5.00×10^{-3} mol/L
C. 0.125 mol/L
D. 1.25 mol/L

Use the following experimental data to answer question 47.

A student was given four metal strips and 1.0 mol/L solutions of the nitrate salts of each of these metals. The metals were labelled M, X, T, and Q, and the solutions contained the ions $M^{2+}(aq)$, $X^{2+}(aq)$, $T^{2+}(aq)$, and $Q^{3+}(aq)$. The student recorded the following observations:

Metal M reacted with the solutions containing $X^{2+}(aq)$ and $Q^{3+}(aq)$ but not with the other solutions.

Metal Q reacted only with the solution containing $X^{2+}(aq)$.

Metal T reacted with $M^{2+}(aq)$ but was not tested with any other solution.

47. Which of the following lists the metal ions as oxidizing agents in order of decreasing strength?

A. $X^{2+}(aq)$, $Q^{3+}(aq)$, $M^{2+}(aq)$, $T^{2+}(aq)$
B. $T^{2+}(aq)$, $M^{2+}(aq)$, $Q^{3+}(aq)$, $X^{2+}(aq)$
C. $M^{2+}(aq)$, $X^{2+}(aq)$, $T^{2+}(aq)$, $Q^{3+}(aq)$
D. $Q^{3+}(aq)$, $X^{2+}(aq)$, $M^{2+}(aq)$, $T^{2+}(aq)$

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48. The oxidation potential for the half-reaction $Pb(s) \longrightarrow Pb^{2+}(aq) + 2e^-$ is

A. +0.87 V
B. +0.13 V
C. −0.13 V
D. −0.87 V

49. Which statement is CORRECT?

A. Cu(s) spontaneously reacts with both $Zn^{2+}(aq)$ and $Fe^{2+}(aq)$.
B. Zn(s) spontaneously reacts with $Cu^{2+}(aq)$ but not with $Fe^{2+}(aq)$.
C. Fe(s) spontaneously reacts with $Zn^{2+}(aq)$ but not with $Cu^{2+}(aq)$.
D. Cu(s) spontaneously reacts with neither $Zn^{2+}(aq)$ nor $Fe^{2+}(aq)$.

50. The E°_{net} value for the reaction $Ni(s) + 2Ag^+(aq) \longrightarrow Ni^{2+}(aq) + 2Ag(s)$ is

A. +0.34 V
B. +0.57 V
C. +1.03 V
D. +1.26 V

51. The ion that will oxidize $I^-(aq)$ to $I_2(s)$ but will not oxidize $Br^-(l)$ to $Br_2(aq)$ is

A. $Fe^{3+}(aq)$
B. $Fe^{2+}(aq)$
C. $Sn^{2+}(aq)$
D. $MnO_4^-(aq)$

52. Which reaction is nonspontaneous?

A. $2Na(s) + 2H_2O(l) \longrightarrow 2Na^+(aq) + 2OH^-(aq) + H_2(g)$

B. $Cu(s) + 2Ag^+(aq) \longrightarrow Cu^{2+}(aq) + 2Ag(s)$

C. $Cl_2(g) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2(l)$

D. $Cu(s) + Ni^{2+}(aq) \longrightarrow Cu^{2+}(aq) + Ni(s)$

Use the following information to answer question 53.

$W^{2+}(aq) + X(s) \longrightarrow X^{2+}(aq) + W(s)$	(spontaneous)
$W^{2+}(aq) + Y(s) \longrightarrow Y^{2+}(aq) + W(s)$	(spontaneous)
$X^{2+}(aq) + Y(s) \longrightarrow Y^{2+}(aq) + X(s)$	(spontaneous)
$Y^{2+}(aq) + Z(s) \longrightarrow Z^{2+}(aq) + Y(s)$	(spontaneous)

53. Another spontaneous oxidation-reduction reaction would occur between

A. $X^{2+}(aq) + Z(s)$

B. $Z^{2+}(aq) + Y(s)$

C. $Z^{2+}(aq) + W(s)$

D. $Y^{2+}(aq) + W(s)$

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54. In an electrochemical cell with zinc and lead as electrodes, 3.0 A are generated for 6.0 h. The mass lost at the anode is

A. 1.4×10^2 g
B. 8.8×10^1 g
C. 4.4×10^1 g
D. 2.2×10^1 g

55. A technician wants to electroplate 10.0 g of gold onto a ring by immersing it in a solution of $AuCl_3(aq)$ and using a power source that supplies 4.00 A of current. For what length of time should the cell be allowed to operate?

A. 3.67×10^3 min
B. 2.45×10^2 min
C. 61.2 min
D. 20.4 min

Use the following information to answer question 56.

An operating lead storage battery involves these two half-reactions:

$PbO_2(s) + SO_4^{2-}(aq) + 4H^+(aq) + 2e^- \longrightarrow PbSO_4(s) + 2H_2O(l)$ $\quad E^\circ = +1.68$ V

$PbSO_4(s) + 2e^- \longrightarrow Pb(s) + SO_4^{2-}(aq)$ $\quad E^\circ = -0.36$ V

56. When a lead storage battery is discharged,

A. lead(IV) oxide is consumed
B. lead is produced
C. lead(II) sulphate is consumed
D. sulphuric acid concentration increases

YOU HAVE NOW COMPLETED THE MULTIPLE-CHOICE SECTION OF THE EXAMINATION. PLEASE PROCEED TO THE NEXT PAGE AND ANSWER THE WRITTEN-RESPONSE QUESTIONS IN PART B.

PART B

INSTRUCTIONS

Please write your answers in the examination booklet as neatly as possible.

Marks will be awarded for pertinent explanations, calculations, formulas, and answers. Answers must be given to the appropriate number of significant digits.

NOTE: The perforated pages at the back of this booklet may be torn out and used for your rough work.

TOTAL MARKS: 14

START PART B IMMEDIATELY

FOR DEPARTMENT USE ONLY

(6 marks)

1. A student performed an experiment during which 17.04 g of hydrogen sulphide gas were burned in a calorimeter to form $H_2O(g)$ and $SO_2(g)$. The heat produced was used to heat 1.50 L of water from 14.60°C to 55.20°C.

a. Using the Standard Heats of Formation provided in the data booklet, calculate the molar heat of combustion of $H_2S(g)$.

b. Use the student's data to determine the experimental value for the molar heat of combustion of $H_2S(g)$.

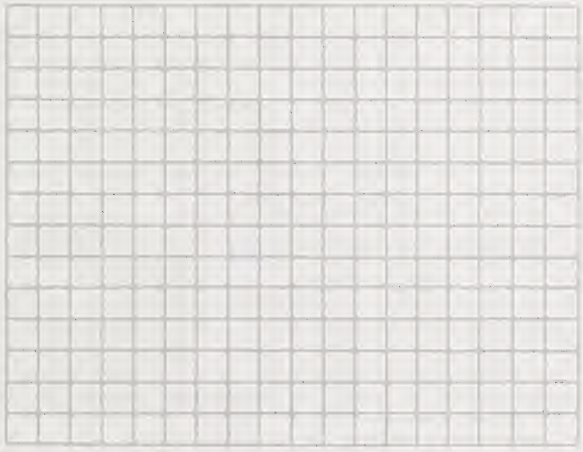
c. List one factor and how it may account for any difference between the ΔH values obtained in part a and part b.

Use the following data to answer question 2.

A student performed an experiment to determine the titration curve for an acid by titrating it with 0.10 mol/L KOH(aq). Using 25.0 mL of acid, the following observations were made:

mL of KOH(aq) added	pH of solution
5.0	0.8
30.0	1.4
45.0	2.2
55.0	11.8
70.0	12.3
90.0	12.6

2. a. Plot the titration curve on the grid provided and identify the equivalence point on the graph. Include and label a numerical scale for each axis. **(4 marks)**



b. Classify the acid as monoprotic or diprotic and support your choice.

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(4 marks)

3. An astute chemistry student pointed out to the teacher that problems could develop in the biology room's salt-water aquarium. The student indicated that the air pump, which was made of iron, could corrode in the presence of the oxygen and water in the aquarium.

The student suggested that the attachment of a small piece of zinc metal to the iron pump would prevent the corrosion of the iron. Would this suggestion solve the problem? Support your answer by utilizing any relevant equations, calculations, and accepted theories.

(NO MARKS WILL BE GIVEN FOR WORK DONE ON THIS PAGE)

FOLD AND TEAR ALONG PERFORATION

TEAR OUT SHEET

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M1 M2 M3 M4

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CHEMISTRY 30

NAME: (LAST NAME) (FIRST NAME) DATE OF BIRTH: Y M D SEX:

PERMANENT MAILING ADDRESS: _____

(Apt./Street/Ave./P.O. Box) (Village/Town/City) (Postal Code)

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